

DESCRIPTIONS OF FOUR NEW SPECIES OF AUSTRALIAN
CADDIS-FLIES, (ORDER TRICHOPTERA).

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(With one Plate and six Text-figures).

The study of the Caddis-flies or Trichoptera of Australia and Tasmania has been greatly neglected, the most recent contribution to our knowledge of them, by Dr. G. Ulmer (1916), listing only twenty-four species all told, of which one genus and six species are described as new. This is certainly only a small fraction of the total Caddis-fly Fauna actually existing, since I have, in my own collection, about fifty undescribed species, most of which have been gathered from comparatively very few localities. These insects being for the most part unattractive and lacking in bright colours, are seldom taken by the ordinary collector. The systematist, again, if he wishes to study and describe them, finds many difficulties in his path. Until he has arrived at a considerable knowledge of the Order, he will require to study *at least four specimens* of each species, two males and two females. Two of these should be dissected, and cleared mounts made of their wings, mouth-parts, antennae, legs and abdominal appendages. The other two should be set in the usual manner, in order to be made the types of a new species, if, as very frequently happens with Australian specimens, they prove to be undescribed.

It will not be necessary here to go into details of the scheme of the wing-venation, which has been fully set out by Ulmer (1907), in a most comprehensive part of the *Genera Insectorum*, and compared with that of related Orders by myself (1919). The venational notation used in this paper will be the amended notation as given in that work. The classification adopted for the Order will be that given by Ulmer in his work just mentioned. The short notation for the tibial spurs will be used as in Ulmer's work; i.e., "Spurs 2, 4, 4," indicates that the fore tibiae possess one pair of spurs, the middle and hind tibiae two pairs each; while an odd number indicates a terminal spur only (1), or else a terminal pair with a single one further from the apex of the tibia (3).

There remains the necessity for a short explanation of the difficult and very complicated anal appendages of the male. These are best dealt with from above downwards, as follows:—

(a) The tenth tergite, standing dorsally above the anus, is frequently of peculiar shape and sculpture, and may send out either one or two long slender processes, called by Ulmer *fishbone-like processes*, but which I propose to term *apoterga*. (Text-figs. 2, 3, *at*).

(b) On either side of these, latero-dorsally, there project from the ninth tergite the *preanal appendages*, also very variable in shape, sometimes long and slender. (Text-figs. 2, 3, *pa*).

(c) Situated between the tenth sternite above and the ninth sternite below, is a single unpaired median organ, the *penis*, at the tip of which opens the ejaculatory duct. This organ is usually directed obliquely downwards. (Text-figs. 2, 3, *pe*).

(d) Developed ventrally from the ninth sternite, there is a pair of *gonapophyses* (called by Ulmer *genital-faet*), which may be either two-segmented or simple; they are generally either stouter than the other appendages, or of a very distinct shape. (Text-figs. 2, 3, *go*).

(e) A pair of shorter lateral processes from the ninth sternite are sometimes developed, lying close outside the bases of the gonapophyses. (Text-figs. 2, 3, *lp*).

Excellent specific characters are afforded by these genitalia, and no description of a male caddis-fly can be said to be either sufficient or accurate unless these parts are clearly figured, and their differences from those of related species indicated.

The end of the abdomen in the female lacks the specific variation found in the males, but the development of the tenth tergite is often sufficiently peculiar to offer a good specific character, and should most certainly be availed of when describing a new species from females only. (See Text-figs. 4, 5).

The four new species described in this paper are four of the most beautiful Caddis-flies yet found in Australia. Two of them will be found figured in one of the coloured plates accompanying the article on "Insects" in the forthcoming Australian Encyclopaedia of Messrs. Angus and Robertson, Sydney.

FAMILY POLYCENTROPIDAE.

Genus STENOPSYCHODES Ulmer, 1916.

Ulmer in Arkiv for Zoologi, Bd. 10, No. 13, p. 5, figs. 7-11.

Genotype: *St. mjöbergi* Ulmer (op. cit., p. 8), described from two males taken on Bellenden Ker, N. Queensland. ♀ unknown.

This remarkable genus is only doubtfully placed by Ulmer in the family *Polycentropidae*, owing to the fact that the last segment of the maxillary palpi is not very clearly annulated, and also because it possesses characters indicating affinities in other directions. Ulmer considers that it comes nearest to *Pseudostenopsyche* Dohler, from Chile; but, as only the female of this genus is known, the comparison is by no means complete.

Three new species are here assigned to this genus, and in two of these the female is known. It is possible, therefore, to extend the generic definition given by Ulmer, so as to include the characters of both sexes.

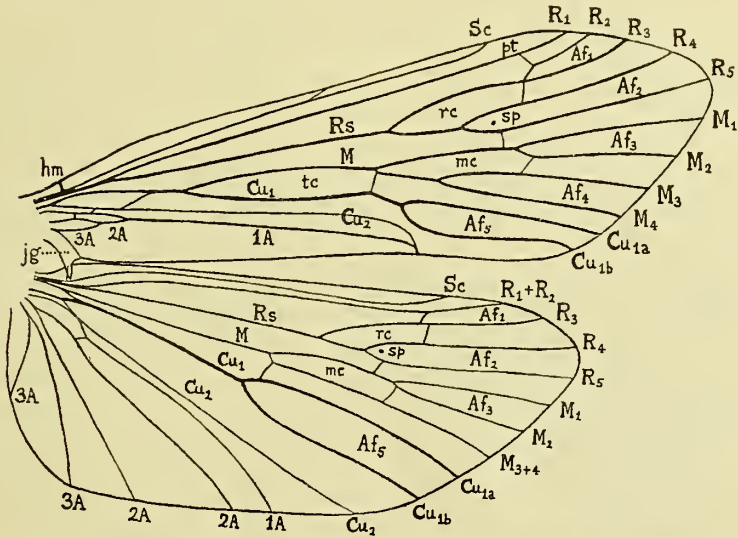
Head: *Ocelli* absent. *Eyes* prominent. In the male, the head is produced forward into a long *rostrum*, resembling that of *Plectrotarsus*; this is formed from the labrum and labium, the palpi of the latter being placed close up to the apex of the rostrum. In the female, these parts are not produced, and there is no definite rostrum. *Antennae* strongly built, longer than the forewings; their

basal segments set close together between, and a little in front of, the eyes, *Maxillary palpi* with two short basal segments; third segment long; the fourth about two-thirds as long as the third; fifth segment as long as the other four taken together, not very clearly annulated, but flexible and waved.

Thorax: *Legs* long and slender, the tarsi as long as the tibiae. Spurs 3, 4, 4; the subapical spurs of fore and middle tibiae placed at or a little before the middle, those of hind tibiae a little beyond the middle.

Abdomen: *Appendages* of male all strongly developed; the *apoterga* and the *preanal appendages* long and slender, the *penis* and *gonapophyses* stoutly built, and a pair of *lateral processes* from the ninth sternite lying close outside the latter. Female with the tenth tergite produced into a cornute process.

Wings: *Forewing* narrow at base, broader towards apex, which is rather narrowly rounded; a prominent jugal lobe projects from near the base transversely across the costal space of the hindwing. *Hindwing* broader, almost equally wide from base to end of Sc. *Wing-venation* complete and of primitive form, all the apical forks being present, and all the cells closed. Specialisations are, in the forewing, the bend of Cu₁ on leaving, *tc*, the distal arching of Cu₂ and the great shortening of 2A and 3A; in the hindwing, the great strength of Cu₁, the large size of its apical fork, the development of a wide anal area, and the forking of 2A and 3A near the base. The venational scheme is shown in Text-fig. 1.



Text-fig. 1: Stenopsychodes hiemalis n. sp., ♂. Wing-venation. 1A, 2A, 3A, the three anal veins; Af₁ to Af₅, the five apical forks (of which Af₄ is never present in hindwing); Cu₁, first cubitus, with its branches Cu_{1a}, Cu_{1b}; Cu₂, second cubitus or vena dividens; *hm*, humeral veinlet; *hg*, jugal lobe; M, media, with its four branches M₁ to M₄; *mc*, median cell; *pt*, pterostigma; R₁, main stem of radius; R_s, radial sector, with its four branches, R₂ to R₅; *rc*, radial or discoidal cell; Sc, subcosta; *sp*, wing-spot; *tc*, thyridial cell.

Key to the Species.

1. Smaller species, expanding about one inch; third apical fork of forewing short, stalked 2.
- Larger species, expanding well over one inch; third apical fork of forewing either sessile on *mc*, or with *M*₁ and *M*₂ arising together from it 3.
2. In the male, the gonapophyses are much shorter than the preanal appendages, and have a strongly projecting interior tooth at one-third from apex *St. mjöbergi* Ulmer
In the male, the gonapophyses and preanal appendages are of equal length, and the former have no projecting internal tooth.
St. montana n. sp.
3. Body black, forewings heavily marked with rich black and gold.
St. melanochrysta n. sp.
Body yellowish brown, forewings fawn-coloured, with a delicate reticulation of pale fuscous *St. hiemalis* n. sp.

STENOPSYCHODES MONTANA n. sp.

(Plate XXIVA., fig. 1; Text-fig. 2).

♂. *Total length* 10.2, *forewing* 11, *hindwing* 9.5, *expanse* 24 mm.

Head black, with sparse golden hairs, a conspicuous patch of bright golden hairs between antennae. *Occiput* much swollen behind. *Antennae* (broken off) with basal segment black, somewhat swollen. *Eyes* greyish black. *Palpi* dull blackish.

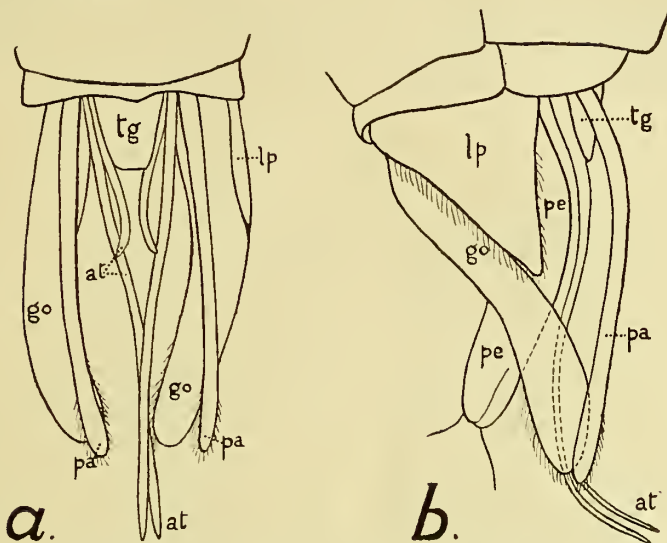
Thorax black with sparse golden hairs on nota. *Legs* dull blackish.

Abdomen slender cylindrical, black. *Appendages* rich brown, except basal two-thirds of gonapophyses, which are blackish. The ninth tergite is very short, the tenth narrow, produced to about two-fifths the length of the shorter pair of apoterga, and having a broadly truncated apex. Of the two pairs of apoterga, the shorter arise the closer together, converging until they almost meet close to their apices, then turning and diverging sharply; they are slender, sharply pointed, and somewhat less than half as long as the gonapophyses. The second pair of apoterga are excessively long and slender, about one-fourth as long again as the gonapophyses, converging from their bases to near half-way, when they run very close together and finally curve sharply upwards to their sharp apices beyond the gonapophyses. Preanal appendages of same length as gonapophyses, fairly slender and only slightly curved; their apical fourth slightly hairy, apex not sharply pointed. Penis broad, subcylindrical, somewhat shorter than gonapophyses, its apex notched, curving slightly downwards, and carrying a pair of titillatory bristles. Gonapophyses broad and strongly built, the basal half curving upwards, the apical half slightly inwards; the tips well rounded, slightly hairy. Closely appressed against and somewhat above the basal half of each is a broad, subtriangular process from the ninth sternite, carrying a series of short stiff hairs along the margin which borders the gonapophysis. These appendages are shown in dorsal view in Text-fig. 2, *a*, in lateral view in Text-fig. 2, *b*.

Wings: *Forewings* with all the veins outlined in black on a rich fulvous ground colour; distal border from beyond pterostigma around apex to tornus continuously margined with black, most deeply at apex itself. Numerous cross-bars of black connect all the veins, except in the basal half of the costal space,

thus giving the wing a closely reticulated appearance, as shown in Plate, fig. 1. *Hindwings* paler, semi-transparent fulvous, the distal border and cross-veins fuscous.

♀ unknown.



Text-fig. 2.: *Stenopsychodes montana* n. sp., ♂. Appendages, *a*, dorsal view; *b*, left lateral view. *at*, apoterga; *go*, gonapophyses; *lp*, lateral processes from ninth sternite; *pa*, preanal appendages; *pe*, penis (omitted from *a*); *tg*, tergite of tenth segment.

Habitat: Blue Mountains and Monaro Plateau, N.S.W.; mountains of Victoria and South Australia.

Type: Holotype ♂ (Katoomba, N.S.W., 3300 ft., Nov. 16th, 1912, R.J.T.) in Tillyard Collection, Cawthron Institute, Nelson, N.Z.

This species is fairly closely related to *St. mjöbergi* Ulm. from N. Queensland. *St. mjöbergi* has the preanal appendages half as long again as the gonapophyses, which are much more curved than in *St. montana*, and carry on their inner border, one-third from apex, a strongly projecting tooth, between which and the incurved apex there lies a deep bay. The penis of *St. mjöbergi* is much shorter than the gonapophyses, and apparently carries no titillators. There are other less important differences in the other appendages, as may be seen by consulting Ulmer's figures (1916, fig. 11).

STENOPSYCHODES HIEMALIS n. sp.

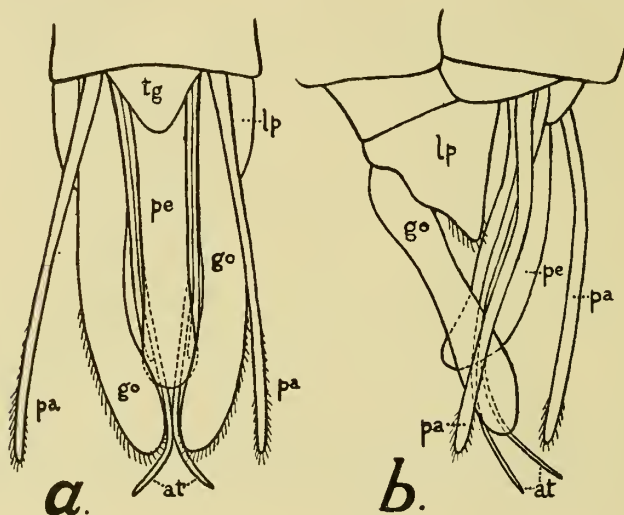
(Plate XXIVA., fig. 2; Text-figs. 1, 3, 4).

♂. Total length 11.8, forewing 17, hindwing 13.2, expanse 35.5 mm.

Head, thorax and abdomen yellowish brown; antennae, legs and

appendages the same colour; eyes greyish black; occiput only slightly swollen behind. Length of hindleg 18 mm.

Wings: Forewings with a very close and delicate reticulation of pale fuscous on a ground colour of fawn, the costal margin and the space between the anal vein and posterior border less infuscated, and hence appearing paler and more definitely fawn-coloured than the rest. All the main veins medium fuscous, except R, which is much paler, and the anal veins, which are darker. Hindwings pale semi-transparent fawn-colour, the veins slightly darker.

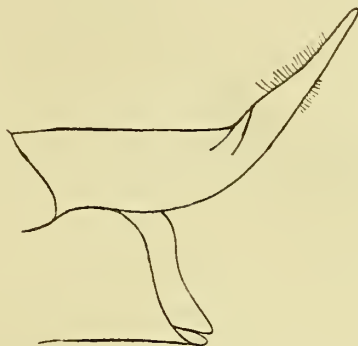


Text-fig. 3.: *Stenopsychodes hiemalis* n. sp., ♂. Appendages. a, dorsal view; b, left lateral view, slightly dorso-lateral. Lettering as in Text-fig. 2.

Appendages: These are on the same plan as in *St. montana*, but differ in the following points:—Tenth tergite not truncated apically; the longer pair of apoterga excessively slender, only slightly longer than the gonapophyses, beyond the ends of which their sharply pointed tips diverge widely upwards and outwards; the shorter pair very slender, nearly as long as the penis. Preanal appendages very slender, nearly straight, slightly hairy. Penis subcylindrical, the apex bent slightly downwards, apparently without titillators. The broad lateral processes from the ninth sternite are not so closely appressed to the gonapophyses, and their ventral border carries a definite bulge near the middle. These appendages are shown in dorsal view in Text-fig. 3, a, ventral view in Text-fig. 3, b.

♀. Closely resembling the male in size and markings, but darker. Antennae 20 mm. (those of the male are broken), dull reddish brown beneath, yellowish brown above. Thorax and abdomen rather dark brown. Forewing more deeply

infuscated than in male, but the space between anal veins and posterior border bright fawn-colour; above this, all the space between cubitus and anals is very darkly infuscated. *End of abdomen* with tenth tergite prolonged as shown in Text-fig. 4.



Text-fig. 4.: *Stenopsychodes hiemalis* n. sp., ♀. End of abdomen, left lateral view.

Habitat: Hornsby, N.S.W. Only found in August.

Types: Holotype male and Allotype female (Hornsby, Aug. 25th, 1917, R.J.T.) in Tillyard Collection, Cawthron Institute, Nelson, N.Z. Also a set of slides prepared from a third specimen (♂) taken on same date.

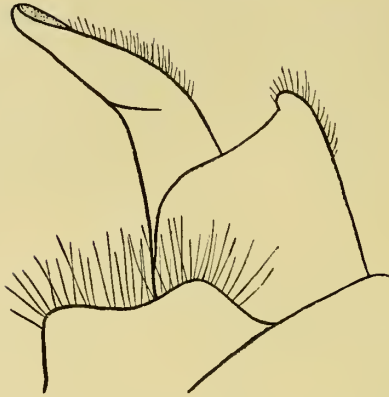
This fine species was discovered quite unexpectedly while searching for Stoneflies during the coldest part of the year. The first specimen was found resting on the inside of the black hollow trunk of a burnt eucalyptus tree near a creek in a precipitous gully. Sweeping the bushes overhanging the creek yielded two more specimens. The locality was visited and carefully searched afterwards at all seasons of the year, without any further specimens being taken. It is the only Caddis-fly known to me which is to be taken in August around Sydney.

STENOPSYCHODES MELANOCHRYSA n. sp.

(Text-figs. 5, 6).

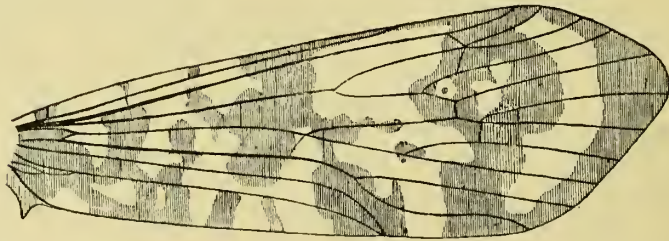
♀ *Total length* 12, *forewing* 16.3, *expanse* 34 mm.

Head, thorax and abdomen jet black. *Antennae* (broken) with basal segment black. *Legs* dull blackish. *End of abdomen* produced into a dark brown, somewhat spoon-shaped process formed from the tenth tergite; ninth tergite carrying a fringe of long hairs. (Text-fig. 5).



Text-fig. 5.: *Stenopsychodes melanochrysta* n. sp., ♀. End of abdomen, left lateral view.

Wings: *Forewing* densely covered with short hairs; colour rich gold and black, arranged in a bold and irregular pattern, as shown in Text-fig. 6. *Hind-wing* black, with an irregular streak of gold along costa spreading downwards beyond half-way to form an irregular blotch of gold embracing the fork of Rs and nearly touching M.



Text-fig. 6.: *Stenopsychodes melanochrysta* n. sp., ♀. Forewing, to show pattern of black (shaded) and gold (left clear).

Habitat: Dorrigo, N.S.W. Two females only.

Types: Holotype ♀ (Dorrigo, W. Heron, undated) in Coll. South Australian Museum, Adelaide. Paratype ♀ in Cawthron Institute Collection, Nelson, N.Z. Both specimens are, unfortunately, much damaged.

Family HYDROPSYCHIDAE.

Genus MACRONEMA Pictet, 1836.

Two species of this widely distributed and handsome genus are known from Australia, viz.: *M. australe* McL. and *M. dubium* Ulmer. A third very strikingly beautiful species is here added.

MACRONEMA PULCHRIPENNE n. sp.

(Plate XXIVA., fig. 3).

♀. *Total length* 9, *forewing* 11, *expanse* 23.5 mm.

Head black, with sparse golden hairs on epieranium. *Antennae* slender, 18 mm. long, black. *Palpi* dark grey.

Thorax: *Prothorax* black, with two round golden spots on pronotum. *Meso* and *metathorax* black, the mesonotum with a large central patch of bright golden pubescence. *Legs* greyish brown; *tibial spurs* long.

Abdomen dull black throughout; in shape somewhat broad and flattened, narrowing towards apex; no prolongation of tenth tergite.

Wings: Smooth and shiny, without any conspicuous hairs, densely pigmented in gold and black, as shown in Plate XXIVA., fig. 3. *Forewing* black, marked with gold as follows: Base of wing gold, with an extension along costa to half-way, notched at about two thirds of its length by an intrusion of the black colour from below; another extension of the gold runs along basal third of posterior margin; pterostigma with a large subtriangular blotch of gold; a large irregular reniform blotch half-way along posterior border; another slightly smaller and more rounded blotch close to torus. Near apex there are three smaller spots, the largest of which is near middle of termen, while two very much smaller ones lie above it near costa. Two or three very minute golden spots are scattered on the black portion of the wing at about one-third from base, and another very small one lies below the pterostigmatic blotch. *Hindwing* with basal two-thirds golden, the rest black, the costa with a narrow extension of the gold up to two-thirds of its length, where it swells out into a small semi-oval golden patch. The division between the gold and black across the wing very irregular.

Habitat: Stanwell Park, N.S.W. Three females, taken by Mr. G. Lyell. F.E.S., on April 24th, 1916.

Types: Holotype ♀ in Tillyard Collection, Cawthron Institute, Nelson, N.Z. Also a paratype ♀ in same collection and another in the Collection of the Museum of Comparative Zoology, Cambridge, Mass., U.S.A.

This and the preceding species are the two most brightly coloured of our Australian Caddis-flies. When flying slowly across a stream, they might be taken for one of the similarly coloured Australian Aretiid moths.

In concluding this paper, I desire to thank Mr. Nathan Banks, of the Museum of Comparative Zoology, Cambridge, Mass., for kindly examining the types of the species here described and confirming my determinations of them; also Mr. W. C. Davies, Curator of the Cawthron Institute, for the excellent photograph reproduced in Plate XXIVA.

EXPLANATION OF PLATE XXIVA.

Fig. 1. *Stenopsychodes montana* n. sp. ♂ (x 3).Fig. 2. *Stenopsychodes hiemalis* n. sp. ♂ (x 3).Fig. 3. *Macronema pulchripenne* n. sp. ♀ (x 3).

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